



Current Carrying Capacity of CompactPCI[®] Connectors

Heather Parsons

Ana Arreola

*Jet Propulsion Laboratory
California Institute of Technology*

9/29/2000



Agenda

What are compactPCI® connectors and why is JPL using them?

What is current carrying capacity?

- *What are the test requirements?*
- *What was the test procedure?*
- *What are the results?*
- *What is the next step?*



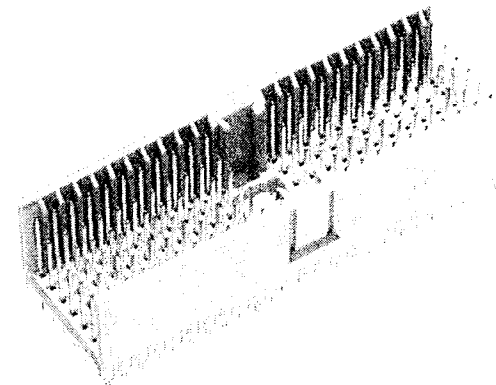
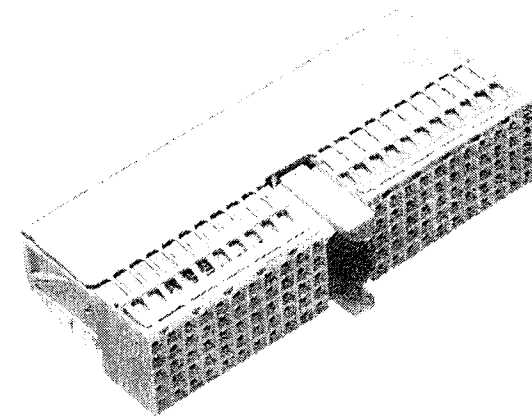
CompactPCI[®] Connector

*PCI - Peripheral
Component Interconnect*

Press Fit

Material

- *Connector Body (glass filled polyester housing)*
 - *Pin (phosphor-bronze with Ni and Au plating)*
- *High Pin Count (110 pins per connector)*





CompactPCI® Connectors for Space Flight Use



Smaller more compact electronics

- *higher density of input/outputs*
- *high speed interface bus*

■ *Launching spacecraft more frequently*

- *commercial parts*
- *use plug and play with ground support equipment*

■ *Validate compactPCI® connectors for use in space flight*



Current Carrying Capacity

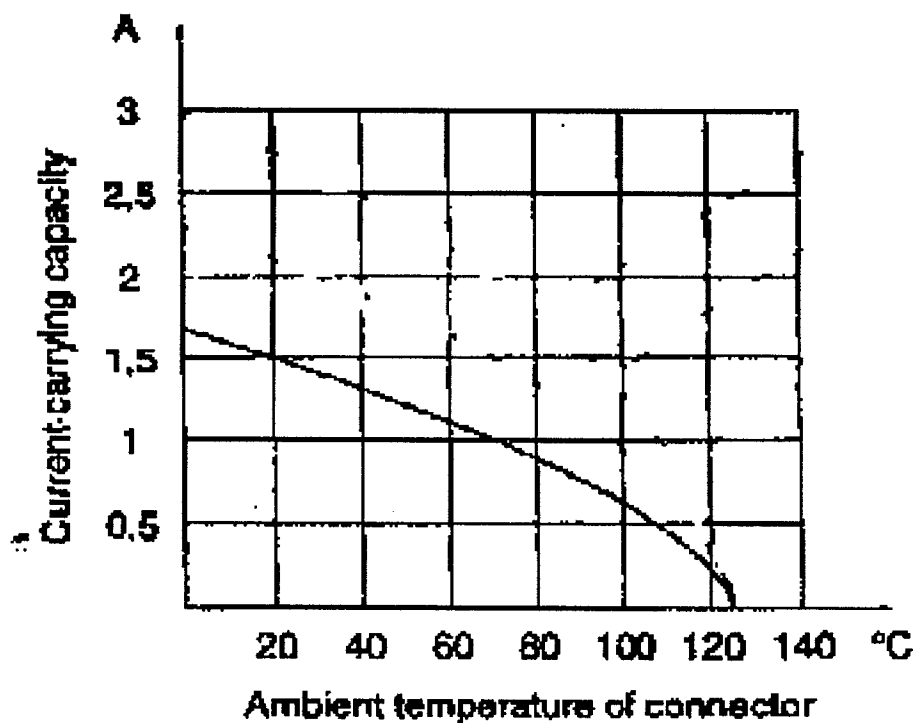
Amount of current a connector pin can carry before the temperature of the connector rises above the manufacturer's suggested temperature limit (in the case, 125°C)

- *Data taken when current is simultaneously flowing through all the pins*



Current Carrying Capacity

Current Carrying Capacity Graph



For example: If the connector is at an ambient of 70°C, 1 A of current will increase the temperature of the connector to 125°C.

Figure 52 – Current-carrying capacity: derating curves for different contact arrangements



Current Carrying Capacity of Vendors



	Current-Carrying Capacity in Air (all pins carrying current)	Vendor's Maximum, Recommended Temperature of the Connectors
Vendor 1	1 A @ 70°C	125°C
Vendor 2	1 A @ 70°C	125°C
Vendor 3	1.5 A @ 70°C	125°C

Data (in air) specified is from the manufacturer's data sheets



Test Requirements

Conditions of space environment (vacuum)

- *The connector's ambient temperature in space is 70°C*
- *1 A of current is required to flow through the connector*

■ *To simplify this test, the evaluation was done in air*



Test Requirements

JPL's requirement for de-rating of air for space application is 60%

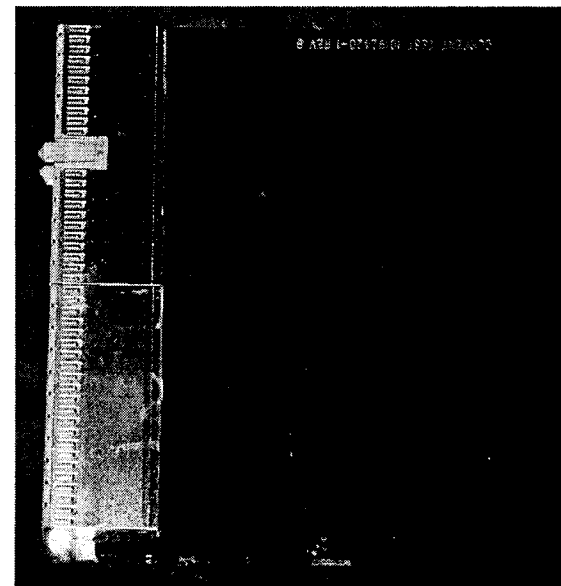
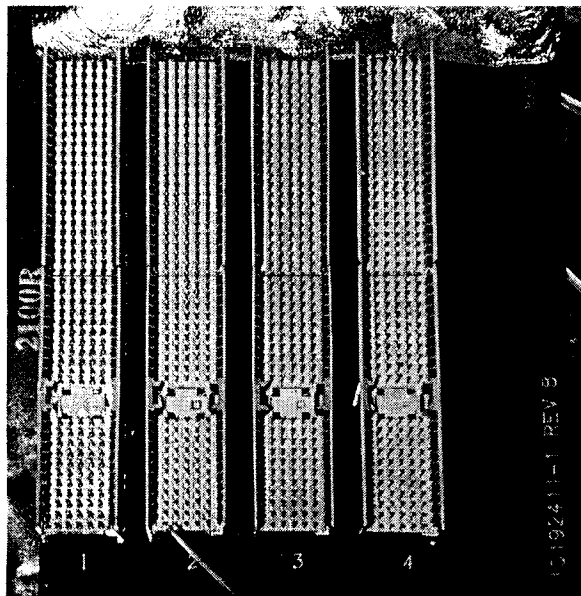
- *With de-rating, the connector must have a current capacity of 1.7 A at room temperature*
- *Ambient temperature of connectors in space is 70°C*
- *The connectors were tested such that the minimum temperature increase was 55°C*
- *This met the manufacturer's required maximum of 125C*



Test Setup

Test Articles

- 3 backplanes: each consisting of the 3 vendors connectors
- 3 cards: one for each backplane
- Connectors were press fit and soldered





Test Setup

Thermocouples

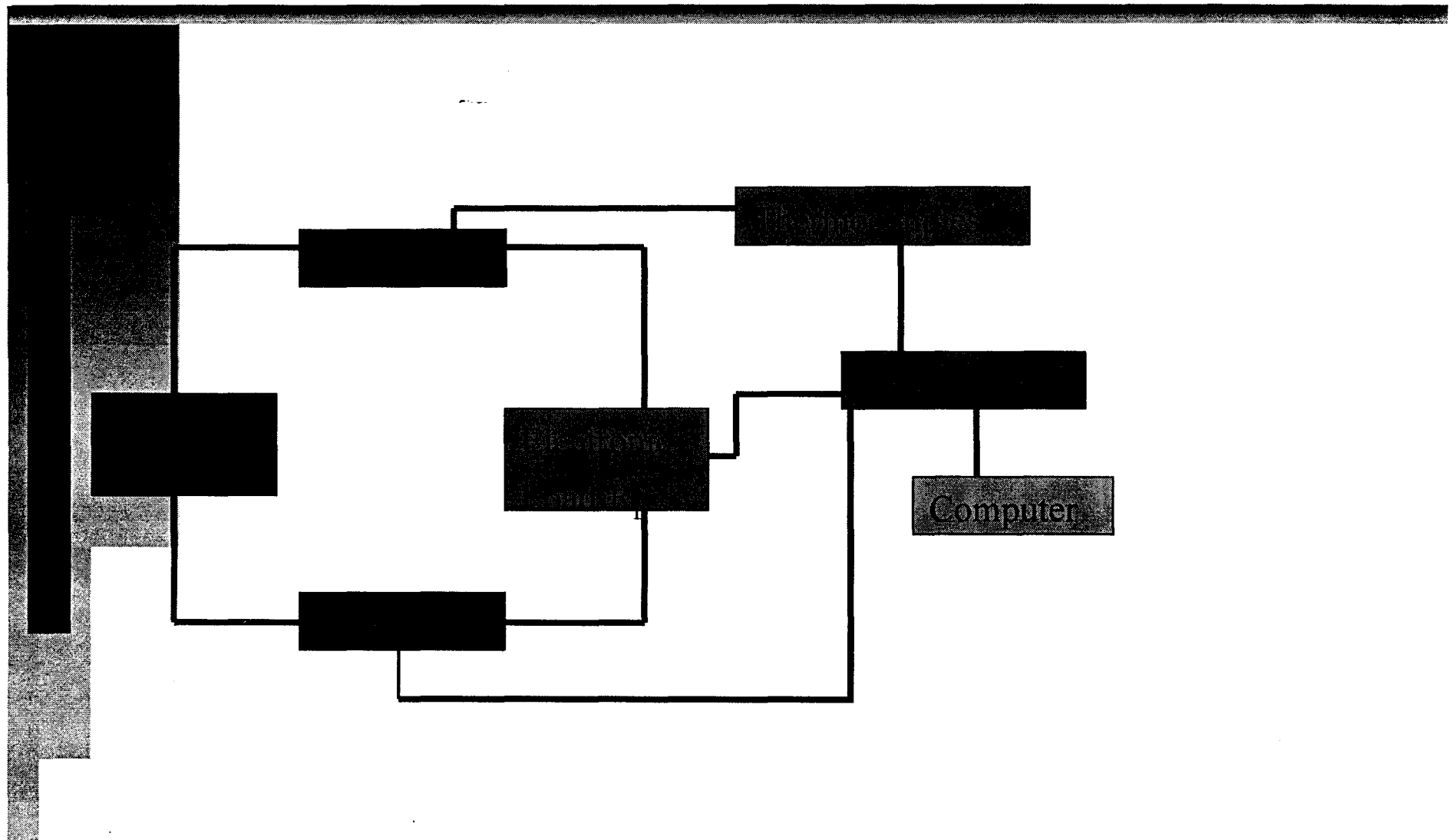
- Each card had 4 thermocouples attached to the connector*
- Each backplane had 4 thermocouples attached to each connector (total of 12 thermocouples)*

Equipment

- Data Acquisition - Delta Logger (Temp and Volt Measurements)*
- Power Supply*
- High Precision Shunt Resistor*
- Resistor Load*



Test Setup





Test Procedure

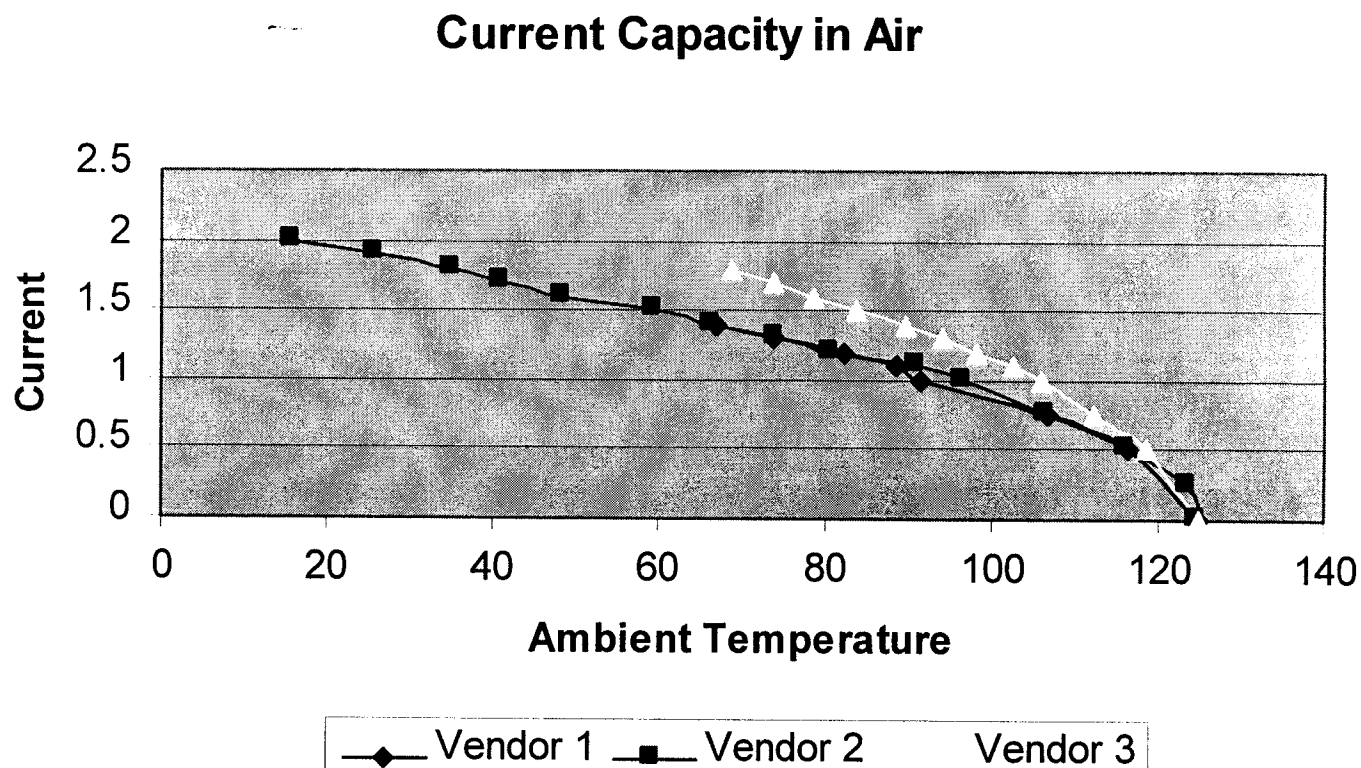
Began test with current at 0.5 A

Incremented by 0.25 A until the current reached 1.0 A

- *Incremented by 0.1 A until the temperature of the connector reached 75°C*
- *Let current stabilize after each increment*



Test Results





Test Results

	Current Carrying Capacity at Ambient of 70°C in Air	Temperature Rise above Ambient
Vendor 1	1.4 A @ 70°C	58°C
Vendor 2	1.4 A @ 70°C	58°C
Vendor 3	1.7 A @ 70°C	55°C



Test Results

Met and exceeded the current capacity specified on manufacturer's data sheets for all three vendors

- ☐ *Only vendor 3 passed the JPL test requirements*



Next Steps

*Perform test in vacuum environment to
correlate data*

*Fabricate chassis to hold backplanes and
cards*